## PHYSICS education

Volume 11 1976 Pages 1—528

Published by

The Institute of Physics

London and Bristol

Copyright © 1976 by The Institute of Physics and individual contributors.

All rights reserved.

Multiple copying of the contents or parts thereof without permission is in breach of copyright. Permission is usually given upon written application to the Institute to copy illustrations and short extracts from the text of individual contributions provided the source (and, where appropriate, the copyright) is acknowledged.

Published by
The Institute of Physics,
47 Belgrave Square, London SW1X 8QX

# PHYSICS education

#### Honorary Editor

W F Archenhold M Phil FInst P

#### **Deputy Editors**

IL Lewis MA FInst P

Saville BSc MInst P

D A Tawney MA MInst P

#### **Editorial Board**

R W Brander BSc FInst P CEng FIEE

C A Crofts BSc FInst P

C E Doust PhD FInst P

R E Ellis PhD

A Gillespie BSc MInst P

OS Heavens DSc FInst P FIEE

R Lawrence PhD MInst P

W K Mace BSc

R D Masterton BSc MInst P

P W Nicholson

**Executive Editor** 

K F G Paulus PhD MInst P

Advertisement Manager

Sadler

P D Noakes BSc(Eng)

C P Ormell MA BLitt

D A Quadling MA FIMA

R Schofield BSc MInstP

P Thomsen MSc

P J de Vries

W Westphal

G W T White PhD FBCS MInst MC

C G Woodford BSc

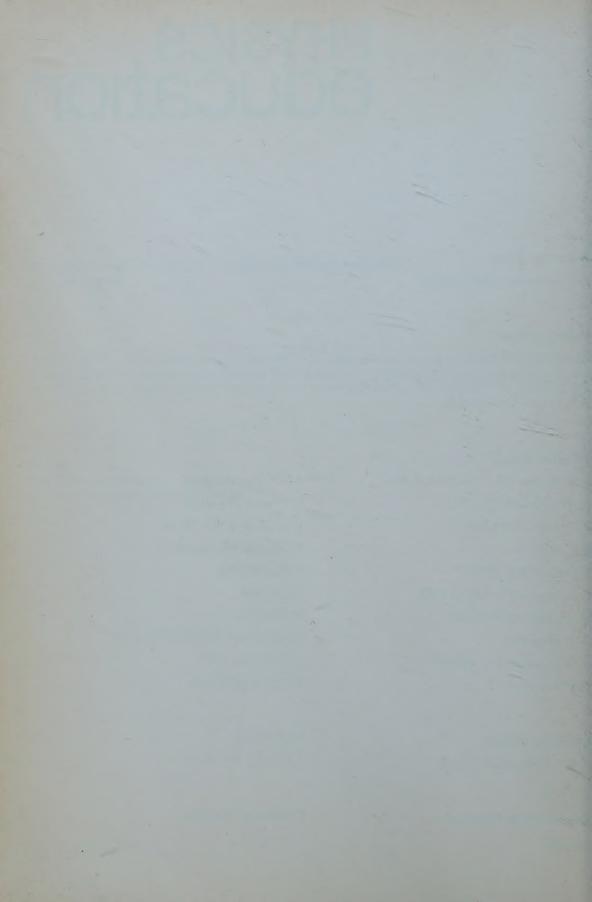
B Woolnough FInst P

#### **Staff Editor**

A P Ashby BSc MAIE

**Circulation Manager** 

I Sadler BA



## Contents of Volume 11

## January 1976

RYDER 28

The future of physics education: W F ARCHENHOLD 8

ducation, physics and technology: H B G CASIMIR

Few science and old cultures: K W Keohane, R Ahmed, J Elstgeest and E W Hamburger 16
The new elementary particles and charm: Lewis

Physics lectures and student notes: BRIAN DAVIES

Dravitational free fall at relativistic speeds: James D Edmonds Jr 36

earle's apparatus revisited: J E LORRIMER, J T McMullan and D G Warmsley 42

The optics of a metal interference filter: A H CUTT-LER 45

Physics on stamps: Appendix VI: E J Burge 50
The mystery of mass-energy: J W WARREN 52
Definitions of mass in special relativity: M A B
WHITAKER 55

The 'paper error' of two examinations in electronic engineering: P J McVEY 58

Leader, News and comment 1 Letters 5 Physics apparatus 7 Queries in physics 32 Notes on experiments 38 Film reviews 60 Book reviews 61 Forthcoming conferences and courses 64

#### March 1976

s physics human? V F WEISSKOPF 75
Pilot A-level in electronic systems G B B CHAPLIN
80

The NEC Link Scheme: Peter Noakes 84
Stressing design in electronics teaching: L G
CUTHBERT 88

Three-dimensional' display of transistor characteristics: T H HARRIS and E MATHIESON 93

The narrow-band model and semiconductor theory:

B K TANNER 97

Simulation of the Schrödinger equation on SHAC:
A STEWART 104

A secondary step to TTL circuitry: A M MACLEOD 111

A cooperative project for physics students: D G C Jones, M G RICHARDS and J LE P Webb 117

The effect of temperature on surface tension: S J PALMER 119

Reinforcement using the Keller plan: P S ALLEN 121

Leader, News and comment 65 Letters 69
Queries in physics 74 Physics apparatus 96
Notes on experiments 100 Film reviews 125
Book reviews 125 Forthcoming conferences
and courses 128

## May 1976

Editorial: W F Archenhold 129

Introduction 131 Modular courses and degree structures: E J BURGE

137
How about medical physics? R E Ellis 141

Why teach physics? Sheila Saville 145 Environmental physics: J L Monteith 147 Building science: D J Oldham 149

Courses in physics in England, Wales and Northern Ireland 151

Courses in physics in Scotland 237 Courses in physics in medical colleges 247 Index 252

#### June 1976

The teaching of temperature to A-level: C B Spur-GIN 267 Dialogues concerning two old sciences: Jon OGBORN

The teaching of thermodynamics at preuniversity level: I F ROBERTS and D S WATTS 277

The thermal expansion of solids: R F Cooper 284 Sorting mixed metals by the thermoelectric effect 200

The analogue computer as an aid to teaching elementary quantum mechanics: M K SUMMERS 296

A simple and versatile scaler–timer: A M MACLEOD 303

The effective photon theory: E S GILLESPIE 307

A concurrent degree in applied physics and education: R L PAGE 310

Leader, News and comment 257 Letters 261 Queries in physics 266 Notes on experiments 292 Physics apparatus 302 Book reviews 314 Film reviews 319 Forthcoming conferences and courses 320

#### July 1976

The Project Physics Course—Notes on its educational philosophy: Gerald Holton 330

Arithmetic operations using TTL: A M MACLEOD 336

An elementary derivation of the van't Hoff law: M. F. Culpin 341

Phonon gas: John S Reid 348

A simple water channel: A S WHITE 354

Magnetic domains: W D Corner and B K TANNER

Physics students and information sources: IAN WINSHIP 362

Seismic-ray tracing: RAMESH CHANDER 365

A teacher-paced self-study course: N B CRYER 371 Newton, language and mass: G BURNISTON BROWN 373

The one-dimensional diatomic lattice: P T SQUIRE 378

Leader, News and comment 321 Letters 325 Notes on experiments 344 Physics apparatus 364 Film reviews 370 Queries in physics 380 Book reviews 380 Forthcoming conferences and courses 384

## September 1976

Practical work in sixth-form physics: Brian E Woolnough 392

Teaching practical physics: Part 1: G R COURT, R A DONALD and J R FRY 397

A 'laboratory only' course with open-book examinations: B S LILEY, R J OSBORNE and A R PEPPER 401 An electronics 'unit laboratory': E R DAVIES and S J PENTON 404

Atoms in the secondary school: Part 1: Georgi Marx 409

Simple experiments on the use of solar energy: G. Vella and H J Goldsmid 413

Digital computers in school physics teaching: R II

MASTERTON 417

Using research papers in student assessment: A F Brown 421

Crystallography and atomic structure: D M NICHO LAS 428

Energy projects in undergraduate physics: R Mor GAN, R B MURRAY and J T McMullan 434

The presentation of the Planck radiation formula R C Dougal 438

Leader, News and comment 385 Letters 388 Physical apparatus 391 Queries in physics 416 Notes or experiments 424 Book reviews 443 Forthcoming conferences and courses 448

## November 1976

Significant physics content and intellectual development: John W Renner 458

Concepts of mechanics among young people: I LEBOUTET-BARRELL 462

Concepts of physics at secondary level: A H JOHN STONE and A R MUGHOL 466

Teaching physics for related sciences and professions: A P French and E L Jossem 469

CAL for undergraduates—physics by pictures: John McKenzie 475

Francis Bacon 1561–1626: D P NEWTON 481

Student attitudes to physics: B H Briggs 483
Teaching practical physics: Part 2: G R COURT

R A DONALD and J R FRY 488

Atoms in the secondary school: Part 2: Georg Marx 493

Physics in the real world—a problem for schools MARY PETERS and AUDREY MILLER 496

The social responsibility of the physicist: M F I Young and R Schofield 498

Optics in schools: A W WILSON 509

Optics—what to teach? BARRIE W JONES 513

Editorial 449 News and comment 450 Letters 45 Film reviews 457, 519 Queries in physics 46 Physics apparatus 479 Notes on experiments 56 Book reviews 517 Forthcoming conferences an courses 520